

REMARKS

In paragraphs 1 and 2 of the Office Action Applicant's prior election of claims 1-6 and 18-43 is acknowledged. Applicant concurs that claims 7-17 are withdrawn from further consideration.

In paragraph 2 of the Office Action it is indicated that Fig. 2 should be designated by a legend such as prior art. Responsive thereto, Applicant has provided a replacement sheet herewith, and Applicant submits that this ground of objection has been satisfied.

In paragraph 4 of the Office Action claims 23-26, 30, 36-39 and 43 are rejected under 35 U.S.C. 102(e) as being anticipated by Gill (US 6,674,616 B2), stating:

“Regarding claims 23 and 36, Gill discloses a hard disk drive [30; Figs. 1-3], including at least one magnetic head [col. 5, lines 30-34; Fig. 6] including a spin valve sensor, having a read head [72] portion comprising:

a magnetic shield layer (S1) [80] being fabricated above a substrate base;
a first electrical insulation layer (G1) [76] being fabricated above said S1 layer;
a spin valve sensor structure [74] being disposed above said G1 layer [76];
wherein said spin valve sensor structure [74] includes a seed layer [218, 220] being fabricated above said G1 layer [74], a PtMn layer [212] being disposed above said seed layer [218, 220] and at least one pinned magnetic layer [204] and at least one free magnetic layer [202] being disposed above said PtMn layer [74] and

wherein said seed layer [218, 220] has an upper surface comprised of NiFeCr [220] having an etched crystalline structure.

As the claims are directed to a magnetic head, per se, the method limitation(s) appearing in lines 8 to 9 of claim 23, and lines 9 to 10 of claim 36, can only be accorded weight to the extent that it/they affect the structure of the completed magnetic head. Note that “[d]etermination of patentability in ‘product-by-process’ claims is based on product itself, even though such claims are limited and defined by process [i.e., “having an etched crystalline structure”, for instance], and thus product in such claim is unpatentable if it is the same as, or obvious form, product of prior art, even if prior product was made by a different process”, In re Thorpe, et al., 227 USPQ 964 (CAFC 1985). Furthermore, note that a “[p]roduct-by-process claim, although reciting subject matter of claim in terms of how it is made [i.e., “having an etched crystalline structure”, for

instance], is still product claim; it is patentability of product claimed and not recited process steps that must be established, in spite of fact that claim may recite only process limitations”, In re Hirao and Sato, 190 USPQ 685 (CCPA 1976).

- Regarding claims 24-26 and 37-39, Gill discloses the NiFeCr layer is formed with a thickness of approximately 20 Å [col. 7, lines 47-50; Fig. 10], which encompasses the claimed range.

- Regarding claims 30 and 43, Gill teaches a spin valve sensor structure [74] includes at least one PtMn antiferromagnetic layer [212] at least one pinned magnetic layer [204] having a composition which includes CoFe, at least one spacer layer [200] having a composition which includes Cu, and at least free magnetic layer [200] having a composition which includes NiFe [Fig. 10]”.

Responsive hereto Applicant has amended independent claims 23 and 36 to recite limitations not taught by the cited prior art. Specifically, Applicant has added the limitation that the top surface of the NiFeCr seed layer is formed with a rough crystallographic surface that is rougher than a top crystallographic surface of a deposited NiFeCr layer. Support for this limitation is found in Applicant’s specification, page 9, line 14 - page 10, line 2.

In the rejection it is indicated that Applicant’s prior limitation “having an etched crystalline structure” constitutes a product-by-process limitation. Applicant has therefore amended the claims to remove the process “etched” limitation and replaced it with a product limitation of a rough crystallographic surface. Such a rough crystallographic surface is depicted as surface 100 in Fig. 5 and described specifically in page 9, lines 17-19 as:

“The etched back upper surface 100 (shown as a roughened line) of the NiFeCr seed layer 98 has an altered crystallographic surface, as compared to the deposited NiFeCr layer 94 of Fig. 4.”

The prior art teaches a deposited seed layer upon which further sensor layers are disposed. As such, the top surface of the NiFeCr (or Ta) seed layer of the prior art is that of a deposited crystallographic surface, and not that of a rough crystallographic surface that is rougher than the deposited crystallographic surface.

Applicant therefore respectfully submits that amended independent claims 23 and 36 recite subject matter that is not taught by or obvious from the cited prior art.

Regarding the remaining rejected dependent claims 24-26, 30, 37-39 and 43, Applicant respectfully submits that these claims are allowable in that they depend from an allowable base claim either directly or indirectly.

In paragraph 5 of the Office Action claims 1-3, 18, 19, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gill (hereinafter Gill '0140 (US 6,430,014 B1) in view of Gill (hereinafter Gill '616) (US 6,674,616 B2), stating:

“Regarding claims 1, 2, 18, 19, 31 and 32, Gill '014 discloses a hard disk drive [30, Figs. 1-3], including at least one magnetic head [col. 5, lines 46-49; Figs. 6 and 11] including a spin valve sensor [130] having a read head [72] portion comprising:

a magnetic shield layer (S1) [152] being fabricated above a substrate base;
a first electrical insulation layer (G1) [148] being fabricated above said S1 layer;

a spin valve sensor structure [200] being disposed above said G1 layer [148];

wherein said spin valve sensor structure [200] includes a seed layer [228, 230, 232] being fabricated above said G1 layer [148], a PtMn layer [214] being disposed above said seed layer [228, 230, 232] and at least one pinned magnetic layer [204] and at least one free magnetic layer [205] being disposed above said PtMn layer [214]; and

wherein said seed layer includes an Al₂O₃ layer [228] and NiMnO layer [230] and a Ta layer [232] [Fig. 12].

Gill '014 does not disclose a seed layer including a NiFeCr layer but teaches other seed layer materials may be desired [col. 9, lines 40-41].

Gill '616 teaches a seed layer, with a thickness of 20 Å, to include Ta or NiFeCr [col. 7, lines 47-50; Fig. 10].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the Ta layer of Gill '014 with a NiFeCr layer as taught by Gill '616.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to substitute the Ta layer of Gill '014 with a NiFeCr layer as taught by Gill '616 because they are known seed layer

materials that are used in spin valves and using them is merely a substitution of art recognized equivalents.

Regarding claim 3, Gill '014 teaches a spin valve sensor structure [200] includes at least one PtMn antiferromagnetic layer [214], at least one pinned magnetic layer [204] having a composition which includes CoFe, at least one spacer layer [202] having a composition which includes Cu, and at least free magnetic layer [206] having a composition which includes NiFe [Fig. 12].”

Responsive hereto, Applicant has amended independent claims 1, 18 and 31 to include the limitation that the NiFeCr seed layer has a rough top crystallographic surface that is rougher than a crystallographic surface of a deposited NiFeCr layer. As argued above with regard to independent claims 23 and 36, this limitation is not taught nor obvious from the cited prior art. Specifically, the cited prior art teaches the deposition of seed layers upon which sensor layers are disposed. There is no teaching within the prior art regarding the nature of the crystallographic surface of the seed layer, other than that the crystallographic surface of the seed layers is that of a deposited seed layer. Applicant's added limitation distinguishes the prior art in claiming that the NiFeCr seed layer has a rough crystallographic surface which is rougher than the crystallographic surface of a deposited NiFeCr seed layer. Applicant therefore respectfully submits that independent claims 1, 18 and 31, as amended, are neither taught by nor obvious from the cited prior art.

With regard to claim 2, Applicant has amended it to include the limitation that the rough top surface is formed by etching a previously deposited NiFeCr top surface. As this is a further method step in a method claim, Applicant submits that the prior art fails to teach or render obvious this step. Whereby amended claim 2 is also allowable.

With regard to dependent claims 3, 19 and 32, Applicant respectfully submits that these claims are allowable in that they depend from an allowable base claim.

In paragraph 6 of the Office Action claims 4-6, 20-22 and 33-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gill (hereinafter Gill '014) (US 6,430,014 B1) and Gill (hereinafter Gill '616) (US 6,674,616 B2) as applied to claims 1, 18 and 31 above, and further in view of Mao et al. (hereinafter Mao) (US 6,490,140 B1), stating:

“Regarding claims 4-6, 20-22 and 33-35, Gill '014 and Gill '616 disclose all the features, supra, but do not show the composition of the NiFeCr layer as $\text{Ni}_{49.5}\text{Fe}_{12.5}\text{Cr}_{38}$.

Mao teaches the composition of seed layer [12] is preferably in the range of $\text{Ni}_{60}\text{Fe}_{15}\text{Cr}_{25}$ to about $\text{Ni}_{48}\text{Fe}_{12}\text{Cr}_{40}$ [col. 4, lines 30-37] which encompasses the claimed range.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to manufacture the NiFeCr layer of Gill '014 and Gill '616 with a NiFeCr composition as taught by Mao.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to manufacture the NiFeCr layer of Gill '014 and Gill '616 with a NiFeCr composition as taught by Mao in order to promote the texture and enhance the grain growth of the free layer or pinning layer consequently grown on top of the seed layer [Mao, col. 1, lines 55-61].

Additionally, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation and optimization in the absence of criticality. In re Swain et al., 33 CCPA (Patents) 1250, 156 F2d 239, 70 USPQ 412; Minnesota Mining and Mfg. Co. v. Coe, 69 App. D.C. 217, 99 F2d 986, 38 USPQ 213; Allen et al. v. Coe, 77 App. D.C. 324, 135 F2d 11, 57 USPQ 136.”

Responsive hereto, Applicant notes that the rejected claims 27-29 and 40-42 are all dependent claims. Applicant respectfully submits that these claims are all allowable in that they depend, either directly or indirectly from an allowable base claim such as amended independent claims 23 and 36.

In paragraph 7 of the Office Action claims 27-29 and 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gill (hereinafter Gill '616) (US 6,674,616 B2) as applied to claims 23 and 36 above, and further in view of Mao et al. (hereinafter Mao) (US 6,490,140 B1), stating:

“Regarding claims 27-29 and 40-42, Gill ‘616 teaches all the features, supra, but does not show the composition of the NiFeCr layer as $\text{Ni}_{49.5}\text{Fe}_{12.5}\text{Cr}_{38}$.

Mao teaches the composition of seed layer [12] is preferably in the range of $\text{Ni}_{60}\text{Fe}_{15}\text{Cr}_{25}$ to about $\text{Ni}_{48}\text{Fe}_{12}\text{Cr}_{40}$ [col. 4, lines 30-37], which encompasses the claimed range.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to manufacture the NiFeCr layer of Gill ‘616 with a NiFeCr composition as taught by Mao.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to manufacture the NiFeCr layer of Gill ‘616 with a NiFeCr composition as taught by Mao in order to promote the texture and enhance the grain growth of the free layer or pinning layer consequently grown on top of the seed layer [Mao, col. 1, lines 55-61].

Additionally, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation and optimization in the absence of criticality. In re Swain et al., 33 CCPA (Patents) 1250, 156 F2d 239, 70 USPQ 412; Minnesota Mining and Mfg. Co. v. Coe, 69 App. D.C. 217, 99 F2d 986, 38 USPQ 213; Allen et al. v. Coe, 77 App. D.C. 324, 135 F2d 11, 57 USPQ 136.”

Responsive hereto, Applicant notes that the rejected claims 27-29 and 40-42 are all dependent claims. Applicant respectfully submits that these claims are all allowable in that they depend, either directly or indirectly from an allowable base claim such as amended independent claims 1, 23 and 36.

Having responded to all of the paragraphs of the Office Action, and having amended the claims accordingly, Applicant respectfully submits that the Application is now in condition for allowance. Applicant therefore respectfully requests that a Notice of Allowance be forthcoming at the Examiner’s earliest opportunity. Should the Examiner have any questions or comments

with regard to this amendment, a telephonic conference at the number set forth below is respectfully requested.

Dated: March 31, 2005

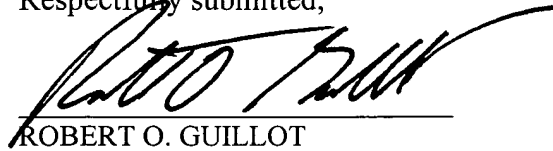
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Respectfully submitted,

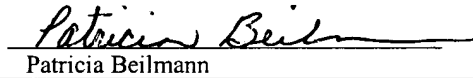


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CERTIFICATE OF MAILING (37 CFR 1.8(a))

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited on March 31, 2005 with the U.S. Postal Service as first class mail in an envelope addressed to: MS Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
Date: March 31, 2005


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